

Solution for Energy Savings and Noise Reduction for Dishwashers using Polyurethanes

Energy Star 10<sup>th</sup> Annual Appliance Partner Meeting Chicago Sep 23, 2009



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#### Designing a Dishwasher:



CUSTOMERS' wish list

Cleaning Performance

Capacity

Reliability

Versatility

Sanitization

Quiet

Ease to use

Water use Energy

consumption

**Chemicals** 

### TECHNOLOGY available

Variable washing pressure/flow rates

Variable speed drive system

Fan assist drying

Water heaters

Sump pumps tech

Motor tech

Soil sensing controls

Spray arms tech



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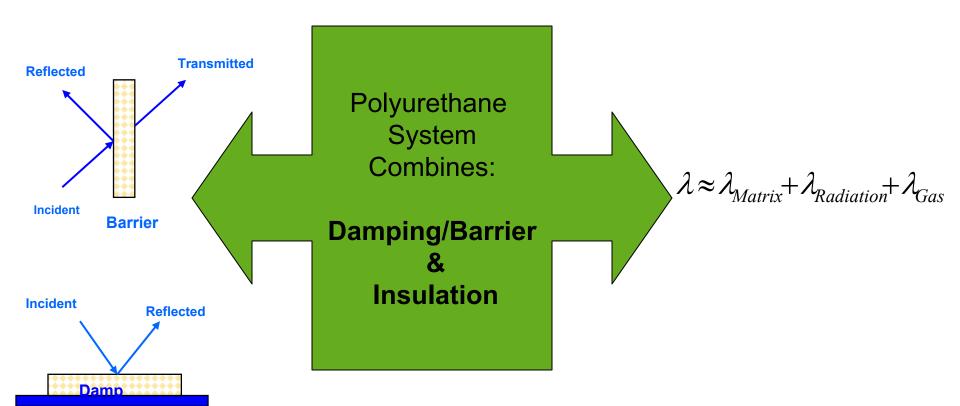
Motor tech

Soil sensing controls

Spray arms tech

## Designing a Dual Solution for a Dishwasher:

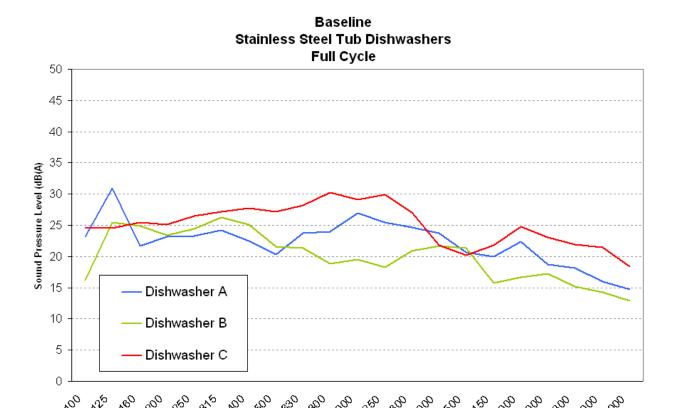






#### **Solving Noise with Polyutheranes**





Different Stainless Steel Tub dishwasher brands have been analyzed

Third Octave Center Frequency (Hz)



#### **NVH Solution for Dishwashers**





- ISO 3744 (1994 -05-01): Acoustics -Determination of sound power levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane.
- IEC 60704-2-10 (2004-04): Household and similar electrical appliances Test code for the determination of airborne acoustical noise.
- ANSI/AHAM DW-1-2005 Household Electric Dishwashers

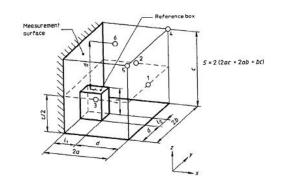
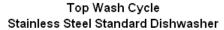


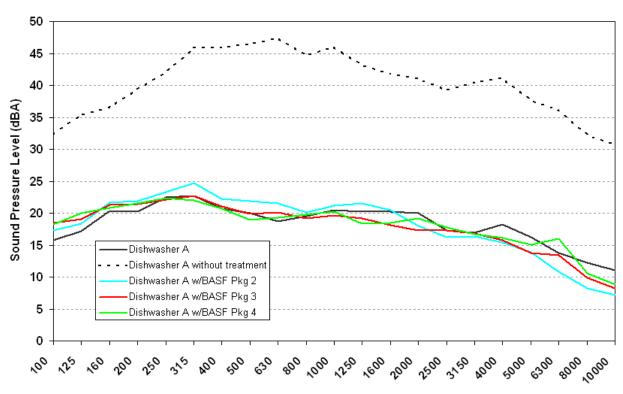
Figure C.7 — Measurement surface (parallelepiped) with six microphone positions for floor-standing appliances placed against a wall



# Case Study NVH Solution with Polyurethanes







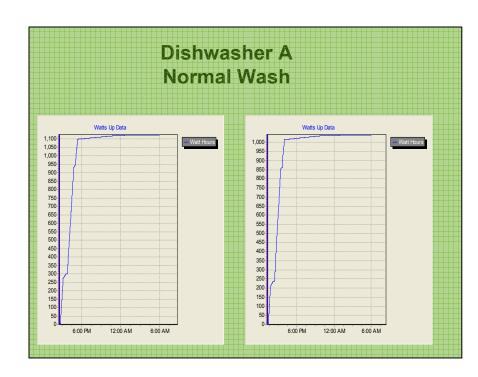
Third Octave Center Frequency (Hz)

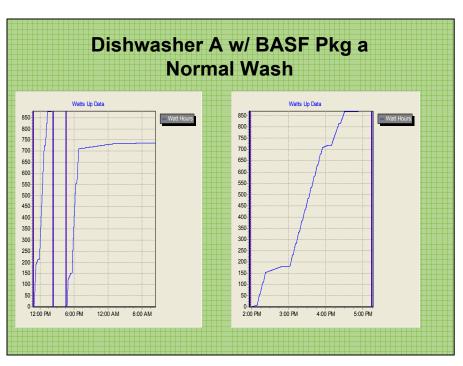
PU Systems is designed to damp noise at low and high frequencies



# Case Study Improving Energy Efficiency







PU Systems is designed to reduce thermal conductivity



#### Solution for Energy Savings and Noise Reduction for Dishwashers using Polyurethanes



Next steps?

Questions?

Thanks!

